

**The Age of
Revolution**

ANIMATING THE EARL'S GREAT ENGINE

THE AGE OF
REVOLUTION
1775 - 1848
WATERLOO
200
LEGACY

BARNSELY MUSEUMS



Heritage Action Zones
Historic England

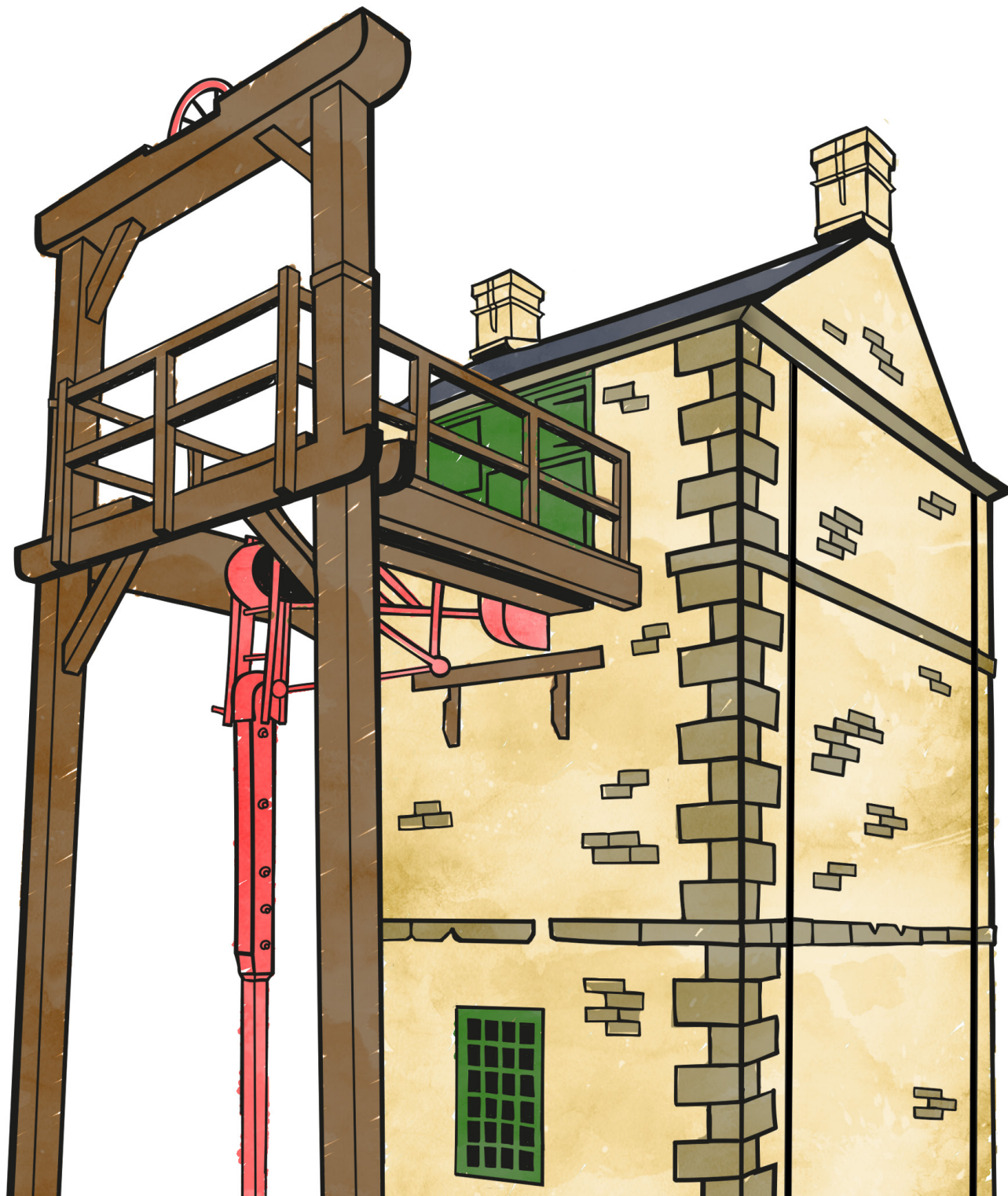


BARNSELY
Metropolitan Borough Council



HERITAGE
FUND

LOTTERY FUNDED



ABOUT THE PROJECT

From January to March 2020, Barnsley Museums worked with Jump Primary School to animate and project the internal workings of the Newcomen Beam Engine at Elsecar. This project was funded by Waterloo200 and Wentworth and Elsecar Great Place, and supported by the Elsecar Heritage Action Zone project. This pack provides lesson plans and resources to enable you to carry out your own digital Age of Revolution project in your school or heritage/arts venue. The project is suitable for UKS2.

Pupils from Jump Primary used iPads to animate the internal workings of the Engine, and then used projection mapping software to project images in the school hall. We then showcased their work at an evening launch event at Elsecar Heritage Centre, projecting the finished animations onto the side of the Newcomen Engine building.

The Newcomen Beam Engine is one of South Yorkshire's finest surviving legacies of the Industrial Revolution. Built in 1795, the Engine was designed to extract water from Elsecar New Colliery to allow the exploration of deeper coal seams. The Beam Engine ran from 1795 to 1923 when it was replaced by electric pumps, at its peak it could draw up to 600 gallons per minute. The Newcomen Beam Engine is the only one in the world to remain in its original location.

Your project does not have to focus on the Newcomen Beam Engine - you could adapt it to focus on anything with moving parts e.g. a clockwork toy, a car, or any piece of relevant local heritage with moving parts that may be suitable. Examples in this pack have focussed on the Newcomen Engine, but you could substitute this for another object/item of your choice, which pupils could visit and/or research as part of the project.



The Age of Revolution project aims to broaden and deepen engagement in the subject of Waterloo and the period of revolution in Europe between 1775 and 1848, engaging actively with over 2,000 UK schools, from across the educational spectrum, in the process. This is through the provision of bespoke educational materials, multimedia technology and partnerships in the educational and cultural landscape to broaden the concept of education and form an education offering suited to all key stages, whilst promoting the evolution of our nation's collective creative culture.

You can find more information on the Newcomen Beam Engine and other 'revolutionary' resources on the Age of Revolution website here:

<https://ageofrevolution.org/200-object/newcomen-beam-engine/>

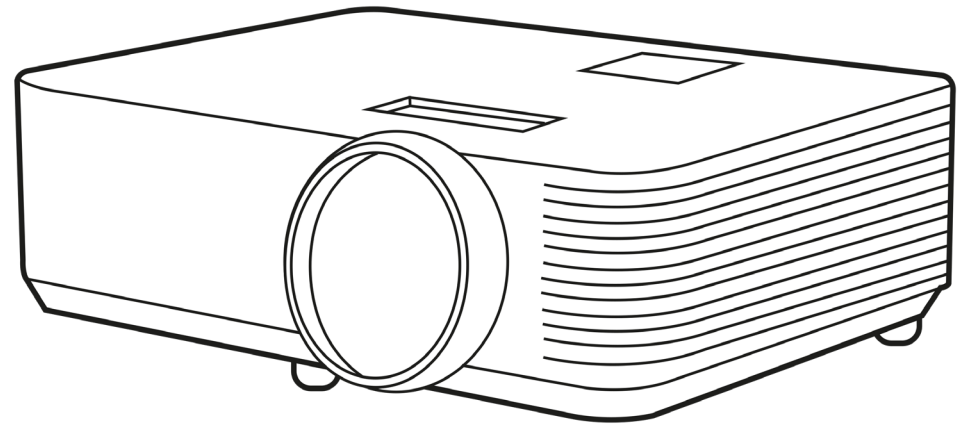
iPads

ideally one between two



RESOURCES NEEDED:

Projector



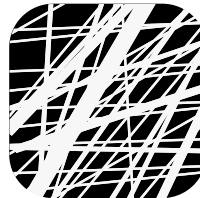
Apps

NOTE

If all of your iPads are connected to the same itunes account, you will be able to just buy the apps once and download them to all devices.



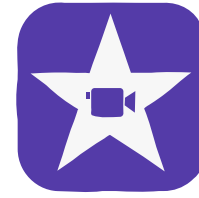
Tagtool
pro
£8.99



Thicket
classic
£1.99



Dynamapper
£4.99



iMovie
FREE



Adobe Spark
Video
FREE



Adobe Spark
Post
FREE

SESSION 1

Introduction to TagTool

Learning objectives

(from the National Curriculum):

Design and Technology:

Pupils will develop their knowledge, understanding and skills needed to engage in an iterative process of designing and making.

Pupils will understand how key events and individuals in design and technology have helped shape the world.

History:

Pupils make a local history study (depending on what you have chosen as your project focus)

Key skills linked to objectives:

Pupils will experiment with digital technology

Pupils will learn about TagTool and how to animate using it.

Pupils will increase their knowledge of the Newcomen Engine or chosen focus

Key Teaching Points

Introduction

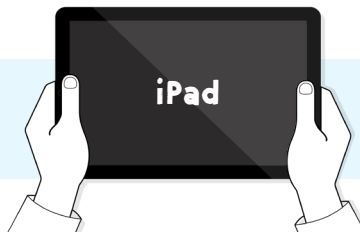
Introduction to the Newcomen Engine and Elsecar Heritage Centre (or your chosen object and venue) – if possible, pupils should visit or research to lay the groundwork for their project.

- What is the Newcomen Engine?
- Why is it important?
- What did it do?

KEY VOCABULARY

- Newcomen Engine
- Coal
- Mining
- iPad
- Animation
- TagTool
- Mechanical

RESOURCE LIST



iPads- one between two



TagTool pro app online TagTool tutorial

<https://www.youtube.com/watch?v=Y0jLqjHbmiE&t=2s>

Introduction to Tagtool

Interface:

- Overview
- Testing/experimenting and play
- Let the pupils have freeform play to enable them to feel comfortable with the software

The best way to understand Tagtool is to experiment with the app. There are a series of useful tutorials by the makers of the app, as well as our own tutorial:

<https://www.youtube.com/watch?v=Y0jLqjHbmiE&t=2s>

Give students a brief overview of Tagtool. Ask the students to create their names and experiment with animating them. Let the students have time to work out how to use the software and experiment – they will pick a lot up from just doing this. Once the students have created and animated their names, get them to share them with the rest of the group.

If all your iPads are all running the latest software and are connected to the same wifi, you can use one iPad as a server to connect all the other iPads with. The ‘master’ iPad needs to be connected to a projector.

Connect the iPads to the main Tagtool ‘master’ iPad and project the students’ work. The great thing about this approach

is that all the students’ iPads will project at the same time allowing the students to create together in real time. Students will see their work side by side as if on one big canvas, and will be able to edit their own projections alongside everyone else’s.

If you are unable to connect to wifi you can connect each student’s iPad individually to the projector to share their work full size.

It is important that the students see and experience their animations to enable them to gain instant feedback and raise their aspirations for what is possible.



SESSION 2

Introduction to animation

Learning objectives

(from the National Curriculum):

Design and Technology:

Pupils will develop their knowledge, understanding and skills needed to engage in an iterative process of designing and making.

Pupils will understand how key events and individuals in design and technology have helped shape the world.

History:

Pupils make a local history study (depending on what you have chosen as your project focus)

Key skills linked to objectives:

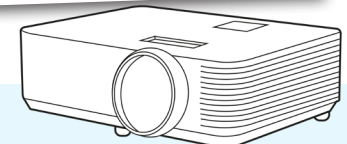
Pupils will experiment with digital technologies

Pupils will learn how to animate objects

Pupils will gain a broader understanding of how mechanical objects work

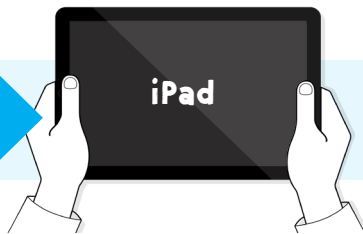
KEY VOCABULARY

- Newcomen Engine
 - Coal
 - Mining
 - iPad



Projector

RESOURCE LIST



iPads- one between two



TagTool pro app online TagTool tutorial
<https://www.youtube.com/watch?v=Y0jLqjHbmiE&t=2s>

Key Teaching Points

Animating the Engine

Use an image of the Newcomen Engine, or your chosen item, and take a photo using the camera. Then import that into TagTool.

Use the image as a template for pupils to draw around. Remind pupils that each element they want to animate needs to be drawn on a separate layer. Once all the layers are drawn, pupils can animate the different elements as necessary by selecting each layer.

Once all layers have been animated, you can delete the original picture/diagram in the background and leave only what the pupils have drawn.

At the end of the task, project each pair's animated work onto the wall of the learning space using the projector.

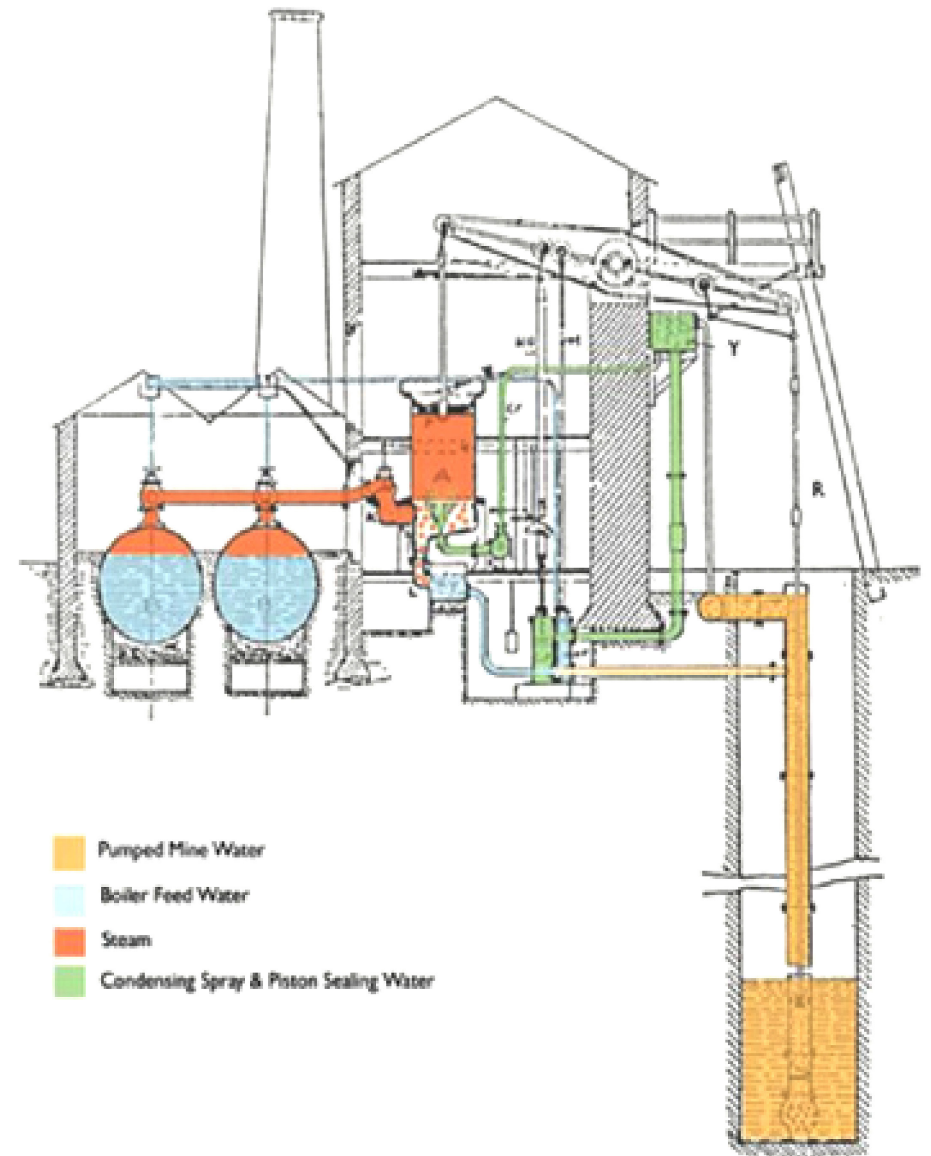
Ask pupils:

If you were to design your own Newcomen Engine, what would it look like?

How would it move? What colour would it be?

What would you add to it to improve the design?

Discuss the idea that the invention of the Newcomen Engine enabled coal mining to become much more efficient and also burned coal as a fuel - what impact has this had on the world? Discuss climate change – ask pupils to think about what they could do to make the Engine more environmentally friendly e.g. renewable energy.



Jump primary pupils drew around this diagram of the internal workings of the Newcomen Engine and animated different layers. They then deleted the background image to leave only what they had drawn over.

SESSION 3

Projection mapping

Learning objectives

(from the National Curriculum):

Design and Technology:

Pupils will develop their knowledge, understanding and skills needed to engage in an iterative process of designing and making.

Pupils will understand how key events and individuals in design and technology have helped shape the world.

History:

Pupils make a local history study (depending on what you have chosen as your project focus)

Key skills linked to objectives:

Pupils will expand on knowledge of digital technologies gained in previous lessons

Pupils will learn about projection mapping and develop spacial awareness skills

Key Teaching Points

Introduction to Thicket

Thicket is an audio visual playground that allows anyone to create beautiful sounds and pictures from simple finger touches.

There is more information on using Thicket here –

<https://apps.intervalstudios.com/thicket/>

In pairs, get students to experiment with the Thicket app. There is no right or wrong way to use the app. This is a way to introduce children to simple projection mapping before they progress to Dynamapper.

Introduction to Dynamapper

Dynamapper allows you to create stunning visual shows on your device by connecting it to a projector.

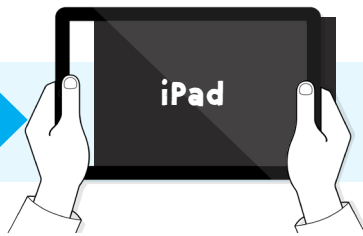
There is more information on using Dynamapper here – <https://dynamapper.net> as well as our online tutorial (see link in resources checklist).

Allow pupils to experiment with the app.

KEY VOCABULARY

- Newcomen Engine
 - Coal
 - Mining
 - iPad

RESOURCE LIST



iPads- one between two



Dynamapper app online tutorial -

<https://www.youtube.com/watch?v=JK9Oj8qVWUQ&t=2s>



Thicket app

Get pupils to create at least 4 or 5 different images, either default pictures from the app or photographs/videos they have taken themselves.

Get pupils to bring their iPads one by one to the projector. This will mirror the iPad screen display. Set up your learning space with a blank wall with some different objects spread across it e.g. gym mats, boxes, chairs etc. Pupils must manipulate the different images they have taken to project them onto these different objects and make sure the shape of the image is correct to map onto the shape of the objects.

Once this is done, import the animations the children created in Session 2 and experiment with projection mapping these onto the wall.

Additional optional activities:

Get pupils to film their progress throughout the project, creating a 'how we made it' video. Pupils should give short interviews about what they are doing and how and why. This allows them to demonstrate and evidence that they know the purpose of what they are learning.

Using the additional information below, get pupils to create a news report on the Newcomen Engine using what they have learnt. Give each pair of pupils a date or event to create a news report about. Pupils should write up the information in their own words in the style of an interview and then rehearse and film their report using iPads.

Get pupils to create posters using the information they have learnt for their news reports.



You could edit all of the news reports and footage together with the projections to create one longer film showcasing the whole project. This could be projected onto the wall of your learning space, or onto an external building wall.

Find out more about how Jump Primary School carried out the project here – <https://www.youtube.com/watch?v=Q8IIQPAHBqo&t=3s>

Have a look at their fantastic projectons here –

<https://www.youtube.com/watch?v=p5P-THi1wK8&t=40s>

Or have a look at the Newcomen Beam Engine/Projection mapping resources on the Age of Revolution website here – <https://ageofrevolution.org/education/activities/how-to-create-an-animated-projection-map/> and read a blog about how we delivered the project here <https://ageofrevolution.org/animating-the-revolutionary-newcomen-beam-engine-with-barnsley-museums/>

ADDITIONAL RESOURCES on the Newcomen Beam Engine:

1795



What happened during this year?

The new shafts at Elsecar New Colliery were finished, and the engine began its working life, pumping water from Elsecar's first deep coal mine.

When the shafts were finished, the Earl Fitzwilliam paid for a celebration feast.

Characters

The Fourth Earl Fitzwilliam – paid for the coal mine to be sunk and the Engine to be built. He called it his 'Great Engine'. He lived in nearby Wentworth Woodhouse.

Benjamin Hall – the Earl's Steward (who was in charge of making sure all the building work was done properly)

John Bargh – an engineer from Chesterfield who designed and built the engine

Martha Hague – helped her brother to dig the shafts. She worked the horse gin, which pulled the soil and rubble up to the surface.

John Hague (Martha's brother) and **Richard Watson** – in charge of the team who dug the shafts

Background information

Before the New Colliery was built, the area where the engine now stands was part of Simon Wood and would have been covered in trees.



On the day that work started on the shafts and the first 'sod' was dug, the Earl paid for a bottle of sod ale to celebrate.

Very soon after the new coal mine was finished, new houses were built for families coming in to the area to work and Elsecar village was started. The houses were considered to be very spacious and modern for the time, with their own gardens and allotments. How do you think the new residents would have felt moving into the Earl's new village?

1815

What happened during this year?

Tar distillery explosion on Distillery Side

Characters

Mr Parker – came down from the North of England, at the request of the Earl Fitzwilliam, to start a new coal tar distillery. He experimented in a barn at Skiers Hall before carrying the stills down to the Elsecar New Colliery by horse and cart.

Mr Parker began to charge the new stills on September 19th 1814, watched by the Lord Milton and the Earl Fitzwilliam himself.

The process was very dangerous, and during the first six months there were a number of explosions at the distillery - the first being on January 1st 1815, when the condenser blew up.

Background information

The Earl Fitzwilliam and Lord Milton came down to see the first day of production. Imagine what it was like living in the houses nearby.

Do you think they would have come down for a look too?

The distillery was very close to the cottages on Distillery Side.

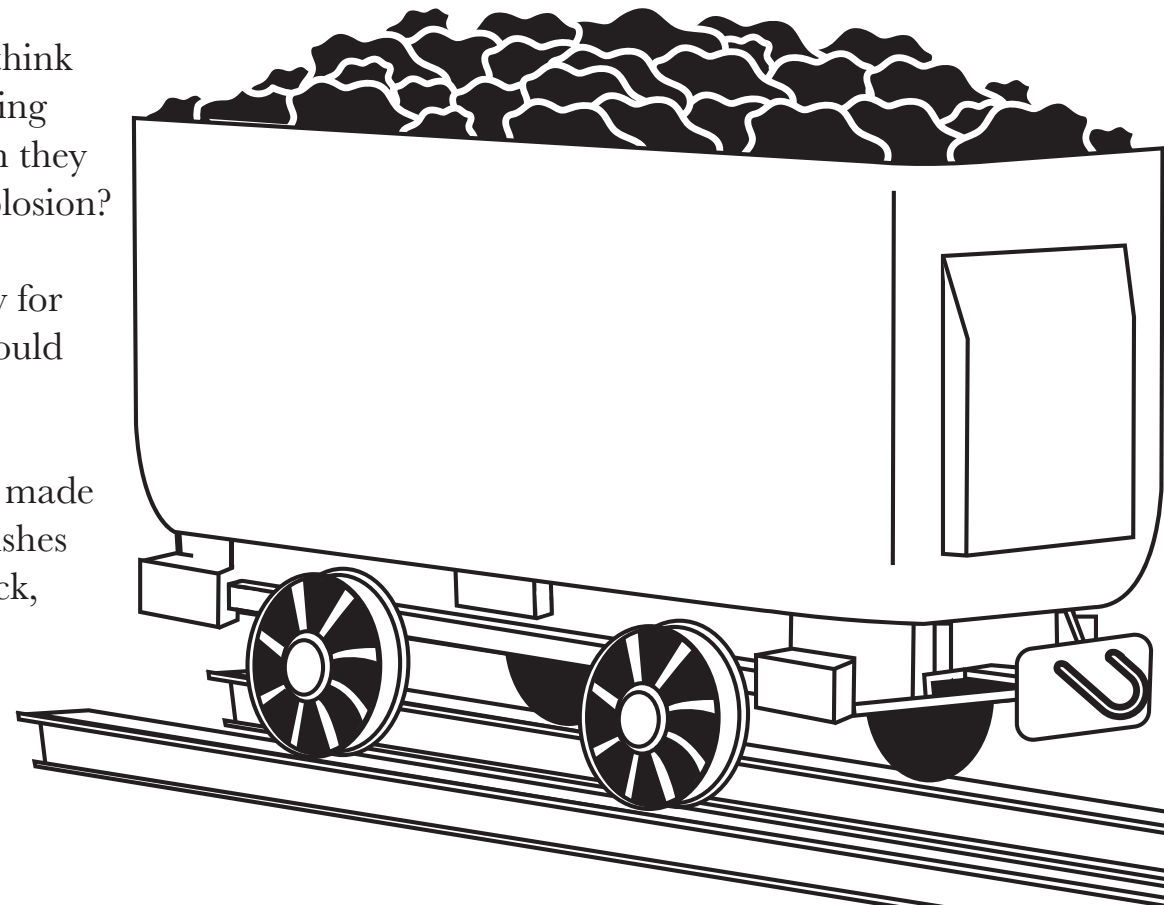
How do you think the people living here felt when they heard the explosion?

How far away for you think it could be heard?

The distillery made coal tar, varnishes and lamp black, which were shipped out by canal.

They were very popular.

The distillery closed in January 1818, but the road it was on (next to the engine) is still known as Distillery Side.



1836



What happened during this year?

A new cast-iron beam was made for the engine (the same beam that is in the engine house now). The old wooden beam had rotted and needed to be replaced.

At the time, Elsecar had two ironworks – one where the heritage railway is now, and one up the hill at Millton. The furnaces ran through the night and you could see them for miles around.

The new beam was cast at the Milton Ironworks and brought down to Elsecar by horse and cart.

The new beam had to be lifted up to the top of the engine house by hand, using a winch – it weighs over 4 tonnes.

Characters

We don't know the names of the people involved, but characters you could think about might include -

The people who made the new beam. How do you think they would have felt knowing that their work was going to be part of the Earl's Great Engine?

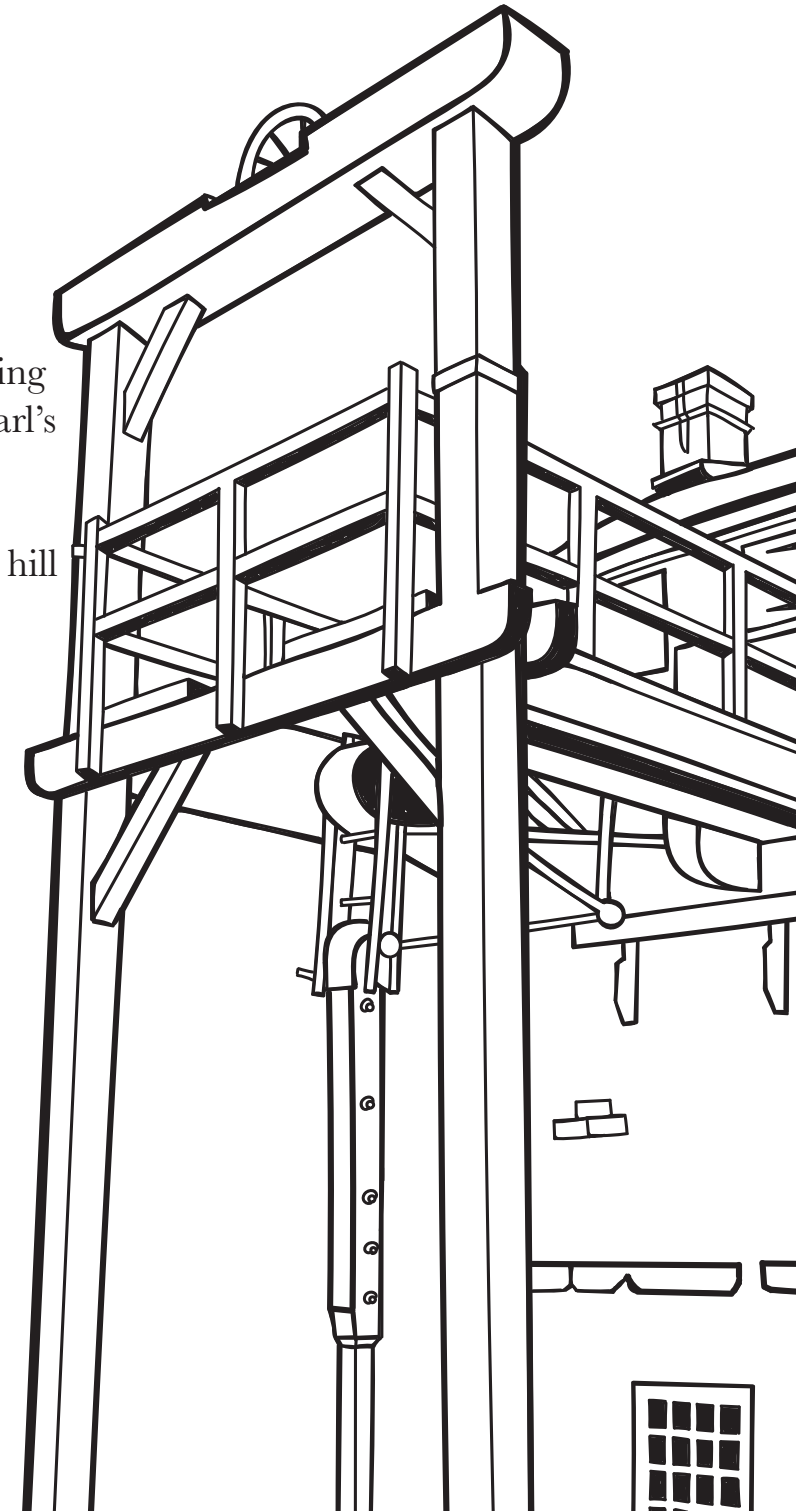
The people who brought the beam down the hill on a horse and cart – imagine how heavy it would have been, and how many horses you would have needed to pull it.

The people who lifted the beam into the engine house – how hard do you think it would have been to lift?

Background information

Bringing the new beam down into Elsecar and lifting it into the engine house would have been a real spectacle – imagine living in one of the houses nearby and watching it all happen.

Do think anything got damaged on the way?



1850



What happened during this year?

The new Elsecar workshops (now the Elsecar Heritage Centre) opened. They were built by the Earl Fitzwilliam to serve his coal mines, ironworks, and his estate. The new workshops were up to date and new, with room for blacksmiths, leather workers, carpenters and more.

As part of the new development, Wath Road was straightened, and new pubs, shops and houses were built along Hill Street, making the village look and feel very different.

Characters

The Earl Fitzwilliam – the workshops belonged to him, and he was very proud of how modern and up to date they were. He brought many rich and famous people to see them.

Benjamin Biram – the Earl’s Steward. He was in charge of the new workshops. His dad, Joshua, had been the Earl’s steward before him.

People who worked at the new workshops – they might already have lived in Elsecar, or might have come to Elsecar specially to work for the Earl.

Background information

Before the workshops were built, Elsecar was much smaller, although it had a busy ironworks, coal mine and canal.

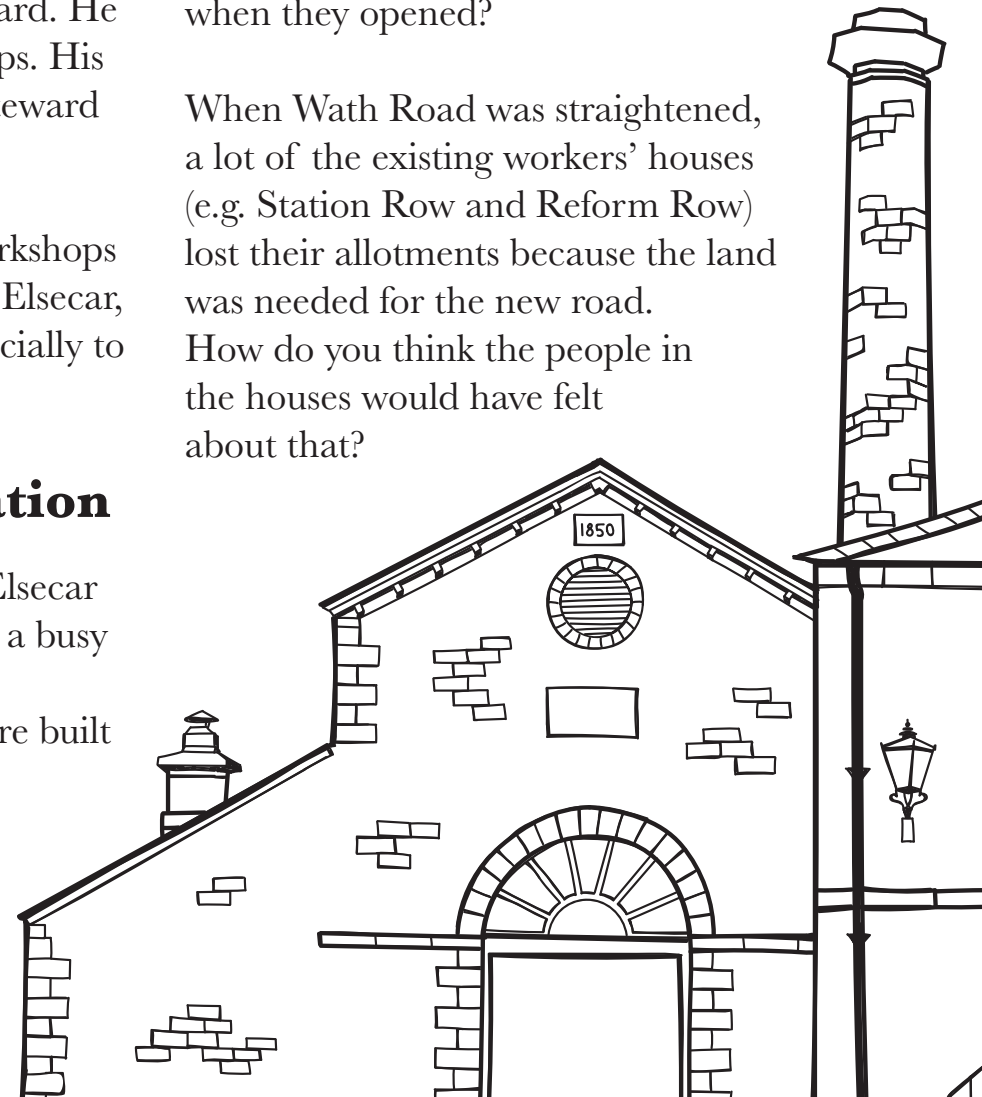
The area where the workshops were built was mostly fields. Imagine how different it would have been when they opened in 1850 –

with all the new activity, noise and smells from the workshops and the huge chimney towering overhead.

In 1850 the Elsecar workshops would have been very modern and impressive. Lots of visitors came to see them, including royalty. Do you think there was a celebration when they opened?

When Wath Road was straightened, a lot of the existing workers’ houses (e.g. Station Row and Reform Row) lost their allotments because the land was needed for the new road.

How do you think the people in the houses would have felt about that?



1928



What happened during this year?

The new electric pumps that had been installed in 1923 to replace the Newcomen engine were damaged in a flood. Until they could be mended, the old steam engine was brought back into use. When the boilers were lit, the smoke made the neighbours' washing all sooty.

Characters

The people working on the pumps/engine

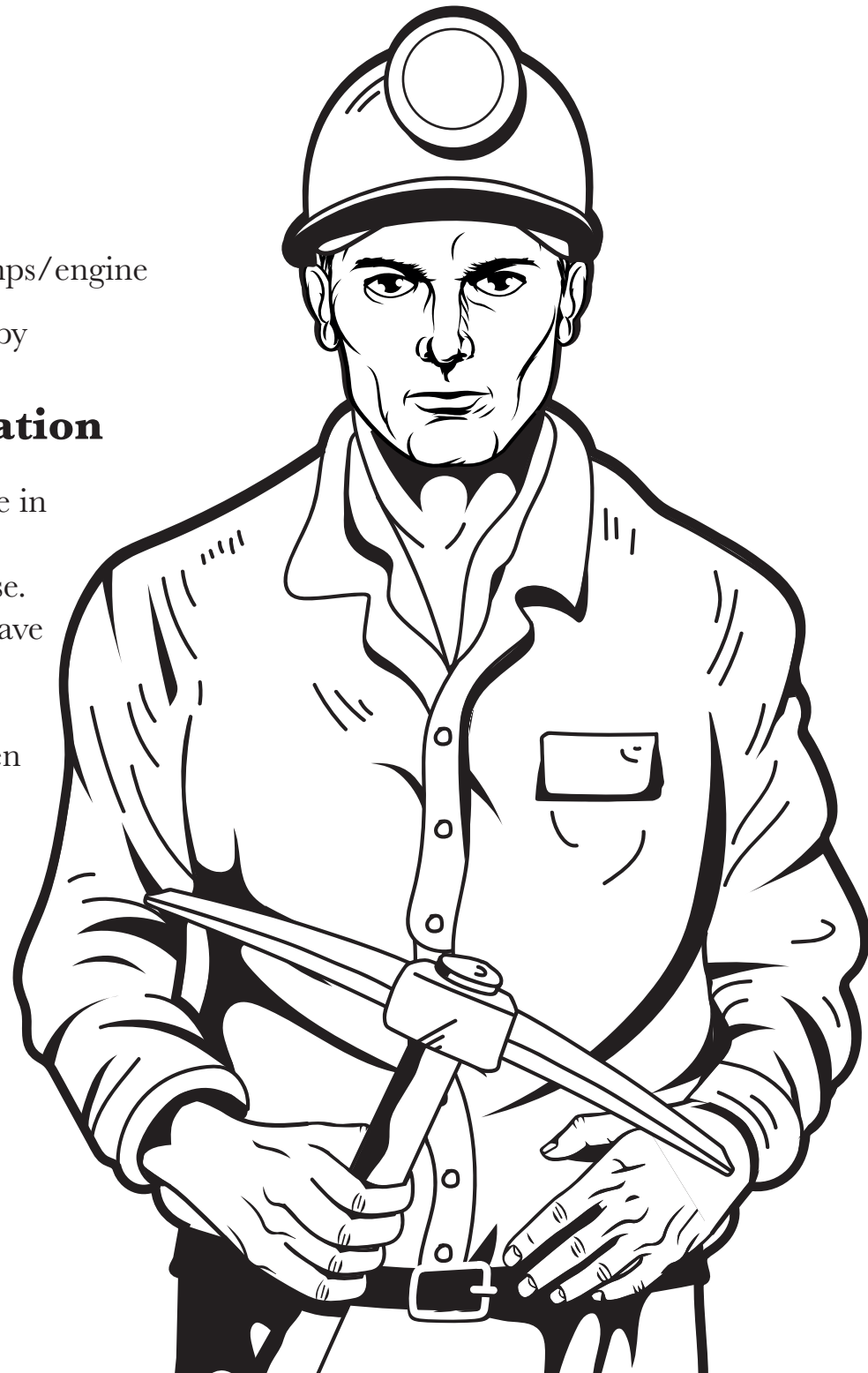
People living in the houses nearby

Background information

Imagine being one of the people in the houses nearby when the old engine was brought back into use. How do you think they would have felt seeing it running again?

Remember, they would have seen the engine nodding up and down all their lives, but the new electric pumps were clean and the old engine ran on coal, which was smoky and smelly.

How difficult do you think it might have been to get the old engine working again?



1937



What happened during this year?

The old boiler house and chimney were knocked down

Characters

The people working on the demolition
People living in the houses nearby

Background information

Imagine being one of the people in the houses nearby when the chimney was knocked down.

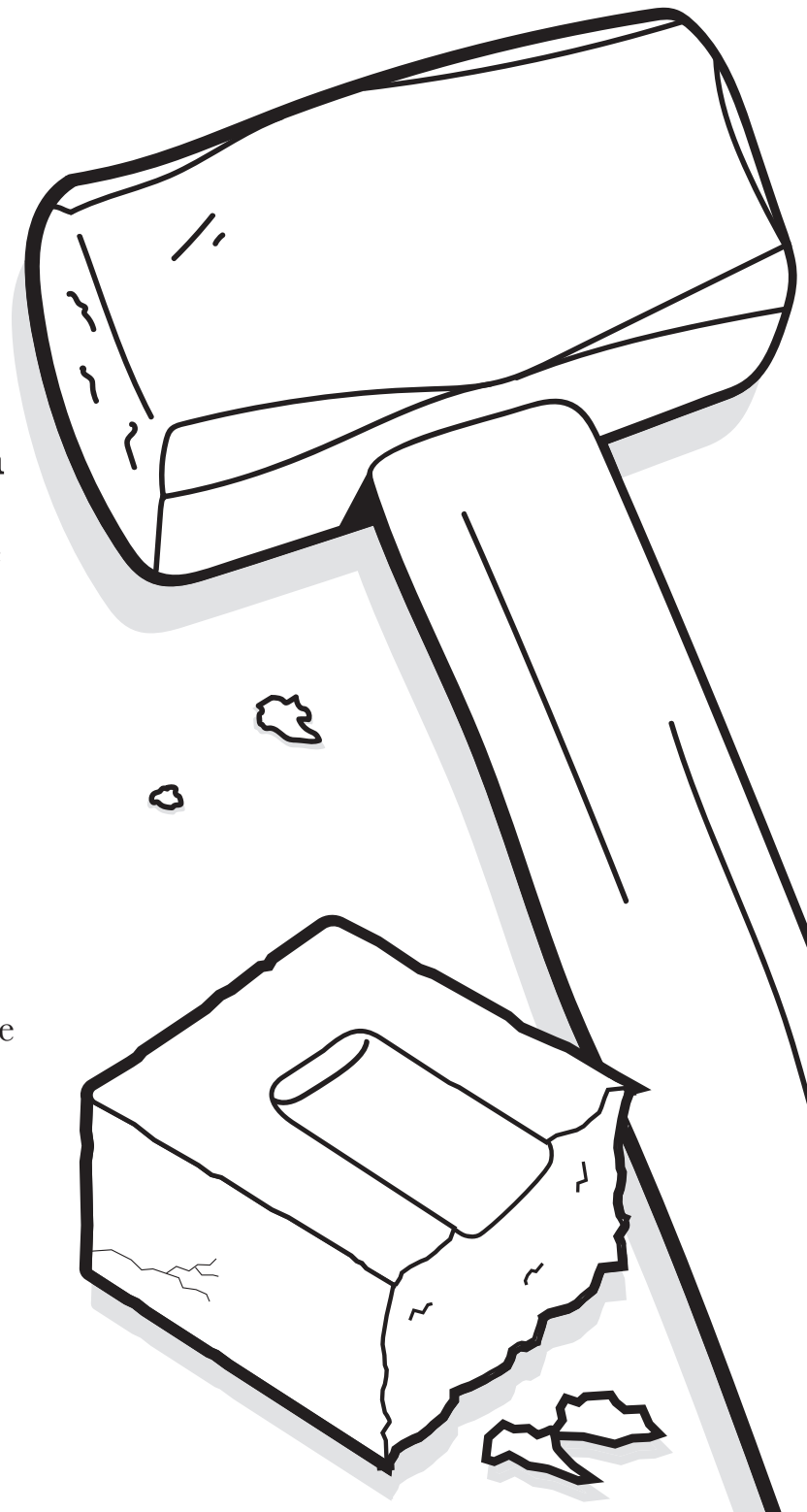
Do you think it made a noise?

How do you think they felt?

Imagine being one of the people carrying out the work.

We know that they were very careful about how they did it, and tried to leave as much of the floor and foundation walls in place as possible.

Why do you think they might have done that?



1700

1712

Thomas Newcomen builds his first atmospheric mine pumping engine

1775

James Watt builds his first 'improved' atmospheric engines (with separate condenser)

1794/5

Newcomen-type Engine built at Elsecar by the Earl Fitzwilliam of Wentworth House

1795

Elsecar New Colliery Opens

1795

First furnace established at Elsecar Ironworks by Darwin and Co. Ltd. of Sheffield

1795/6

First workers cottages built in Elsecar, at Old Row and Distillery Side

1798

Elsecar branch of the Dearne and Dove Canal Opens

1800

1800

New workers cottages built at New Row (now Station Row) to designs by architect John Carr

1801

First blast furnace established at the Milton Ironworks by the Walker Brothers of Rotherham

1802

Original cylinder replaced (to give greater pumping capacity)

1803 – 1815

Napoleonic Wars

1880s

Elsecar and Milton Ironworks close

1815

Tar Distillery explosion on Distillery Side

1836

Wooden beam replaced by large cast-iron beam, made at the Milton Ironworks. Other innovations, including parallel link motion, added.

1837

New waggonway network completed between Elsecar canal basin and the Milton Ironworks

1848

Elsecar Low Colliery (Hemingfield Colliery) opens

1850

Elsecar New Yard workshops built

1853

Simonwood Colliery opens and Elsecar New Colliery (then called Elsecar Mid Colliery) closes.

Newcomen Engine retained as a pumping station for the wider valley.

1853-1856

Crimean War

1900

1905/8

Elsecar Main Colliery Opens

1918

South Yorkshire Pumping Association formed

1920

Hemingfield Colliery, Elsecar and Rawmarsh Pumping Stations sold to the South Yorkshire Pumping Association by the Earl Fitzwilliam

1923

New electric pumps installed replacing the Newcomen Engine. Newcomen Engine retained as emergency back-up pump.

1928

Electric pumps damaged in flood. Newcomen Engine brought back into use for a short period

1937

Newcomen Engine boiler house and chimney demolished

1939-1945

Second World War

1947

Nationalisation of the Coal Mining Industry. Pumping stations taken into control of the National Coal Board (NCB)

1950s

Newcomen Engine falls into complete disrepair

1983

Elsecar Main Colliery closes

1984/5

Miners' Strike (first strike action at Cortonwood Colliery)

1987

Elsecar Workshops (formerly Elsecar New Yard) close

1994

Elsecar Heritage Centre opened by HRH Elizabeth II, in the restored buildings of the Elsecar Workshops. Denationalisation of the Coal Industry – pumping stations closed.

2000

2012/15

Newcomen Engine restored by Barnsley Museums (with funding from the NHLF and Historic England)

2014

The year the Engine was restored

2016

Newcomen Engine re-opened by HRH the Earl of Wessex

2019

Former boiler house uncovered by community dig as part of the Elsecar Heritage Action Zone and Wentworth and Elsecar Great Place projects.



BARNSELY MUSEUMS



BARNSELY
Metropolitan Borough Council

LOCATION OF NEW HYDRAULIC RAMS TO MOVE THE ENGINE